CLAIMS

What is claimed is:

1. An apparatus, comprising:

a silicon substrate; and

a microresonator disposed on said silicon substrate, said microresonator having an annular structure to recirculate light at a desired wavelength.

2. An apparatus as claimed in claim 1, further comprising at least one waveguide disposed on said silicon substrate wherein light may be coupled between said microresonator and said waveguide.

3. An apparatus as claimed in claim 1, wherein the annular structure is a ring.

4. An apparatus as claimed in claim 1, wherein the annular structure is a ring having a length from a center of the ring to a center of a waveguide that forms the ring being proportional to an integer multiple of a desired wavelength.

5. An apparatus as claimed in claim 1, wherein the annular structure is a disk.

6. An apparatus as claimed in claim 1, wherein the annular structure is a disk having a perimeter being an integer multiple of a wavelength.

7. An apparatus as claimed in claim 1, wherein said microresonator includes silicon silicon-germanium nanocrystals in at least one of silicon dioxide, silicon nitride, and alumino-silicate.

8. An apparatus as claimed in claim 1, wherein said microresonator includes a rare earth.

9. An apparatus as claimed in claim 1, wherein said microresonator includes at least one of erbium and ytterbium.

10. An apparatus as claimed in claim 1, further comprising a pump to excite circulation of light in said microresonator.

11. An apparatus as claimed in claim 1, further comprising a pump to excite circulation of light in said microresonator, the pump to tunnel current through silicon dioxide to form electron-hole pairs in the silicon or silicon-germanium nanocrystals in the silicon dioxide.

12. A method, comprising:

forming a microresonator on a silicon substrate, the microresonator having an annular structure to recirculate light at a desired wavelength.

13. A method as claimed in claim 12, wherein said forming includes forming the annular structure to be one of a disk or a ring.

14. A method as claimed in claim 12, wherein said forming includes patterning matrix materials on the substrate using lithography.

15. A method as claimed in claim 12, wherein said forming includes using a mask to prevent implantation of silicon in a region outside the annular structure.

16. A method as claimed in claim 12, further comprising annealing the annular structure.

17. A method as claimed in claim 12, further comprising annealing the annular structure using laser annealing.

18. A method as claimed in claim 12, wherein said forming includes fabricating silicon or silicon-germanium nanocrystals near erbium by chemical vapor deposition.

19. A method as claimed in claim 12, further comprising forming at least one waveguide proximate to said microresonator wherein light may be coupled between said microresonator and said waveguide.

20. A method as claimed in claim 12, wherein said forming includes using an optically active element having an excited state lifetime at a wavelength detectable by a photodetector.

21. An apparatus, comprising:

a silicon substrate;

a microresonator disposed on said silicon substrate, said microresonator having an annular structure to recirculate light at a desired wavelength; and

a waveguide disposed above said microresonator to couple light between said microresonator and said waveguide.

22. An apparatus as claimed in claim 21, wherein a distance between said waveguide and said microresonator is equal to or less than 250 nanometers.

23. An apparatus as claimed in claim 21, further comprising a pump disposed above said microresonator to excite recirculation of light in said microresonator.

24. An apparatus as claimed in claim 21, wherein said microresonator is comprises silicon or silicon-germanium nanocrystals.